

REMARKS

Applicant wishes to thank Examiner Kielin for the telephonic interview of September 21, 2001. During such interview currently applied art, specifically Matsuura and Morita, and previously applied art, specifically Yau were discussed. The undersigned pointed out to the Examiner that embodiments of the instant invention provide for forming a dielectric material layer comprising carbon and silicon on the substrate and any integrated circuitry disposed over the substrate prior to the layer's forming. That is to say that embodiments in accordance with the instant invention do not have the limitation of first forming an intervening dielectric layer (such as silicon oxide layer 3 in Figs 7(a)-(c) of Matsuura or silicon oxide layer 9 in Figs. 1 and 2 of Morita).

In addition, the undersigned pointed out to the Examiner that the instant invention includes embodiments that use a "dry" oxygen-comprising moiety. To this effect the Examiner was directed to page 7, lines 5-7 of the specification where such a dry oxygen-comprising moiety is defined. Thus hydrogen peroxide as taught by Yau, Matsuura and others is not included by Applicant's defined oxygen-comprising moiety.

The rejection of Claims 16 and 18 under 35 U.S.C. §112 was also discussed. The undersigned asked the Examiner if the remark on page 3 of the Office Action where the Examiner referred to Applicant's argument implied that the Examiner believed that the specification is enabling for all of the layers to substantially remain the same. The Examiner stated that

he so believed and that an amendment to reflect such would overcome the §112 rejection.

Claims 1-2, 4-13, 16, 18, 20-25, 34-38, 39-42, 44-46, 48-51 and 65 were pending in the instant application, Claims 13 and 38 being withdrawn due to restriction. However, to expedite the prosecution of the instant application, Applicant is canceling all currently pending claims and providing Claims 66-101 for consideration. Such new claims are drafted to specifically address the key issues raised in the telephonic interview discussed above and are therefore believed to be in condition for allowance. Action to this effect is earnestly sought.

Applicant further notes that a Supplemental Information Disclosure with PTO-1449 and cited art is enclosed herewith.

Rejections under 35 U.S.C. §103

Claims 1-2, 4-13, 16, 18, 20-25, 34-38, 39-42, 44-46, 48-51 and 65 stand rejected under 35 U.S.C. §103 as being unpatentable over various combinations of Morita and/or Brinker in view of Matsuura, and in some instances further in view of Miyasaka. Each of Applicant's new claims recite, in pertinent part, chemical vapor depositing a carbon and silicon comprising dielectric material layer on a substrate and the integrated circuitry of such substrate. In addition, such claims recite exposing such carbon and silicon comprising dielectric material layers to an oxygen-comprising moiety in a plasma. The oxygen-comprising moiety being a "dry" moiety.

In contrast Morita, and as admitted by the Examiner, does not teach chemical vapor depositing the dielectric. Rather, Morita teaches that such layer is applied as a liquid and subsequently solidified. Morita also teaches that the liquid layer is dispensed over a plasma CVD formed silicon oxide insulation layer 9 (see, Fig. 1, 2 and the translation at page 4, beginning 9 lines from the bottom of the page). And finally Morita teaches that such liquid material is used as a planarization tool. Specifically, Morita states that the inventors **combined the advantages of both silicon oxide films and organic silicon thin films, paying attention to spin-on glass methods** (see, page 3, paragraph continued from page 2).

Thus where the Examiner alleges that it would have been obvious to one of ordinary skill in the art, at the time of the instant invention, to modify Morita's invention with Matsuura's plasma-enhanced CVD layer formed using hydrogen peroxide and an organosilane, Applicant respectfully asserts that such is in direct opposition to what Morita essentially states is an object of the invention disclosed in JP 63-157443A. To this effect, the Examiner is directed to M.P.E.P. §2143.01, which states, citing *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959), that **THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE**. Here, such is certainly the case for the Examiner's suggested modification as once such a modification is made Morita can no longer combine the

advantages of both silicon oxide films and organic silicon thin films, **paying attention to spin-on glass methods**, as Morita states.

M.P.E.P. §2143.03 establishes that to sustain a rejection under 35 U.S.C. §103, ALL CLAIM LIMITATIONS MUST BE TAUGHT OR SUGGESTED, citing to *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Both Morita and Matsuura disclose that prior to forming a layer consisting essentially of $(\text{CH}_3)_x\text{SiO}_y$ (element 10 in Morita Fig. 2, and element 4 in Matsuura Fig. 1(b)), a layer consisting essentially of SiO_2 is first formed (element 9 in Morita Fig. 2, and element 3 in Matsuura Fig. 1(b)). Thus neither teach or even suggest the limitation of chemical vapor depositing a carbon and silicon comprising dielectric material layer on a substrate and the integrated circuitry of such substrate as is recited, in varying language, in each of Applicant's independent claims. Therefore, even if, *arguendo*, the Examiner's proposed modification did not change the principle of operation of Morita, the combination of Matsuura with Morita would still fail as the requirement of §2143.03 would NOT be met.

Referring now to Brinker, such art is specifically directed to methods of preparing aerogel thin films at ambient pressure (see, Field of the Invention). Thus where the Examiner alleges that Brinker "discloses forming a low-dielectric-constant material comprising, *inter alia*, which inherently has a dielectric constant of less than 3.5 over an integrated circuit," (see, Office Action ¶ 7) such material in Brinker is an aerogel material. Thus, if one of ordinary skill in the art were to modify Brinker, as suggested by the Examiner, with the method of forming a film

disclosed by Matsuura, such a film **could not** comprise an aerogel.

Further since the mechanism by which Brinker's aerogel material provides a low-dielectric-constant is through the porosity of the material (see, Table 1, where porosity ranges from about 40% to almost 90%), modification of Brinker as suggested by the Examiner certainly **not** form a layer with such a range of porosities. In addition, since it is a specifically stated purpose of Brinker to form films at ambient pressure, which in the context of Brinker is atmospheric pressure, the sub-atmospheric pressure of Matsuura's PECVD deposition is in direct contradiction of this purpose.

Applicant respectfully asserts, therefore, that the Examiner's proposed modification of Brinker does not meet the requirements of either M.P.E.P. §2143.01 for at least two reasons. Specifically, (1) the proposed modification changes the principle of Brinker's operation by not forming an aerogel and by not forming a layer of material that provides a low-dielectric-constant through porosity. Also, (2) Matsuura's deposition is at a reduced pressure required by a plasma enhanced deposition method. Using such a method is in direct conflict with Brinker's statement that his invention provides ambient pressure processing. In addition, while Brinker is silent on whether or not a layer of silicon dioxide is formed prior to coating a substrate with the aerogel, Applicant asserts that since Brinker discloses that the aerogel materials are prepared using a variety of materials such as HCl, ammonium hydroxide and trimethylchlorosilane that a protective layer of a material such as silicon dioxide is likely a requirement. Thus since Matsuura does teach the

forming of such a first silicon dioxide layer the combination of Brinker and Matsuura must certainly include this layer. Therefore the combination of Brinker and Matsuura must include such a first protective layer and thus does not meet the requirement of M.P.E.P. §2143.03 since all claim limitations, specifically forming the low-dielectric-constant material on the substrate and the integrated circuitry is not taught or even suggested.

Since Applicant has shown that the two fundamental combinations alleged by the Examiner are flawed and cannot sustain a rejection under §103, Applicant asserts that it is not necessary to reach the teachings of Miyasaka.

In summary, Applicant having responded to each of the rejections of Claims 1, 2, 4-12, 14, 16, 18, 20-25, 34-37, 39-42, 44-46, 48-51, and 65 as such rejections apply to new Claims 66-101, Applicant respectfully asserts that Claims 66-101 are in condition for allowance. Action to that effect is earnestly sought. If, however the Examiner's next action is anything other than a Notice of Allowance, the Examiner is requested to call the undersigned to schedule a telephonic interview. The undersigned is available during normal business hours, Pacific Coast Time.

Respectfully submitted,

Dated: Sept 25, 2001

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Assignee Micron Technology, Inc.
Group Art Unit 2813
Examiner E. Kielin
Attorney's Docket No. MI22-1208
Title: Low k Interlevel Dielectric Layer Fabrication Methods

**VERSION WITH MARKINGS TO SHOW CHANGES MADE
ACCOMPANYING RESPONSE TO JUNE 28, 2001 OFFICE ACTION**

The claims have been amended as follows. Underlines indicate
insertions and ~~strikeouts~~ indicate deletions:

Cancel Claims 1-2, 4-12, 16, 18, 20-25, 34-37, 39-42, 44-46, 48-51
and 65.

Add new Claims 66-101

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